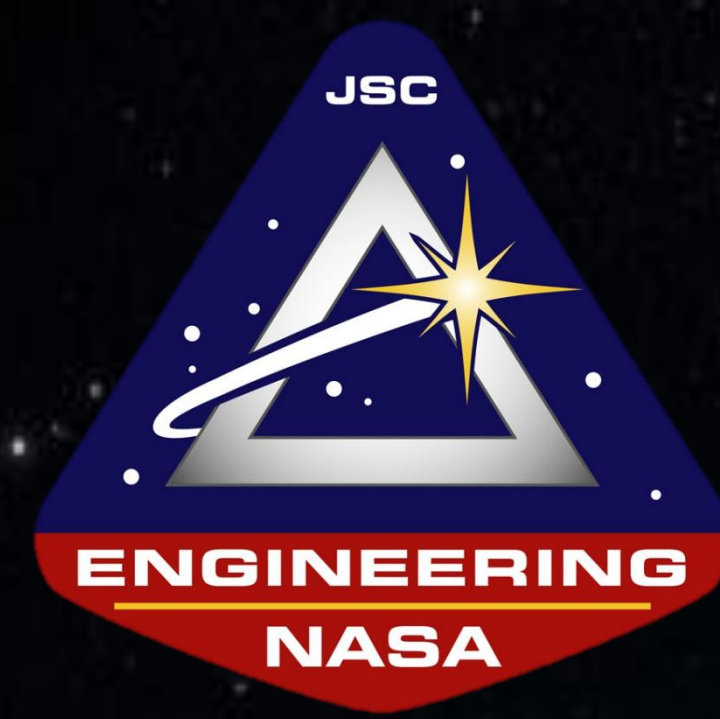
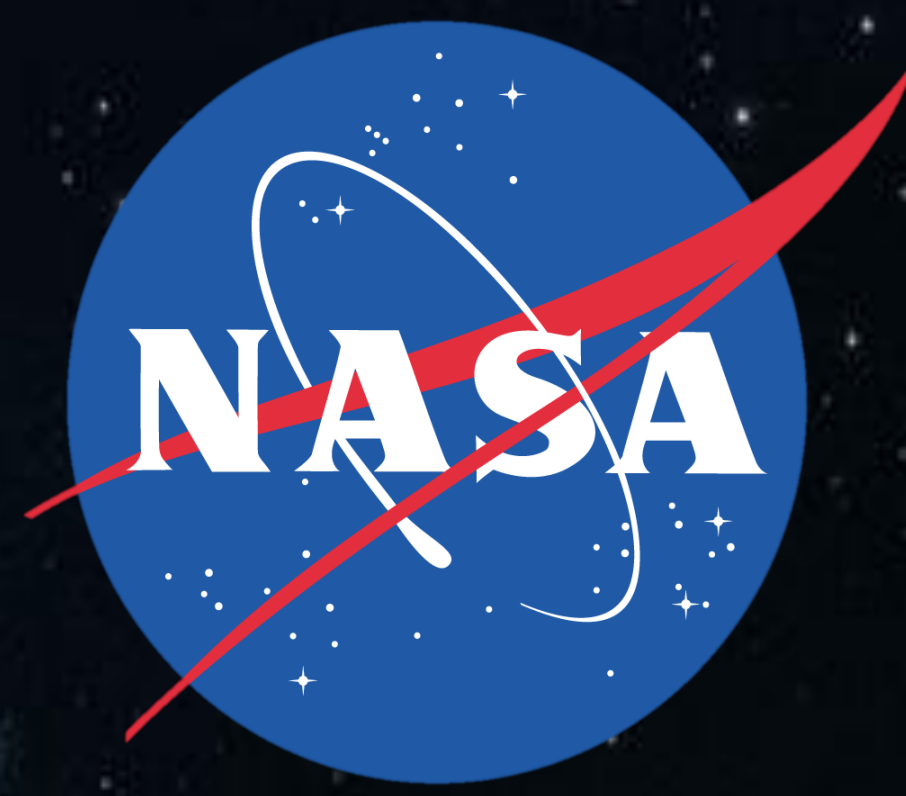




Frame Decoder for Consultative Committee for Space Data Systems (CCSDS)

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GNU Radio

- GNU Radio is a free and open source development toolkit that provides signal processing to implement software radios.
- It can be used with low-cost external RF hardware to create software defined radios, or without hardware in a simulation-like environment.
- GNU Radio applications are primarily written in Python and C++.

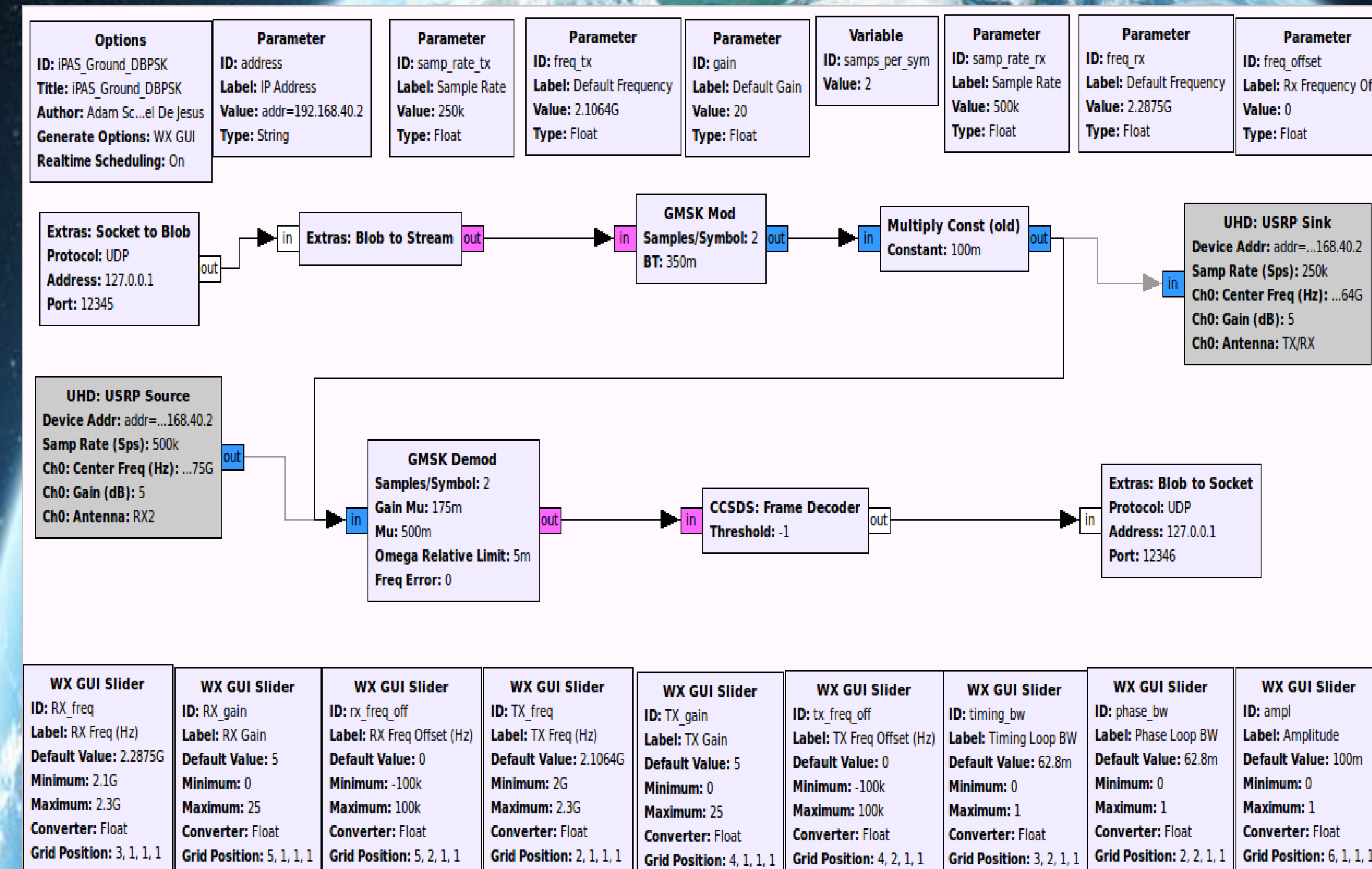
USRP

- The Universal Software Radio Peripheral (USRP) is a computer-hosted software radio designed by Ettus Research.
- The USRP connects to a host computer via high-speed Gigabit Ethernet.
- Using the open source Universal Hardware Driver (UHD), we can run GNU Radio applications using the USRP.

Algorithm

- The algorithm uses a state machine to decode the frames.
- The state machine:
 - STATE FLAG SEARCH
 - STATE HAVE FLAG
 - STATE HAVE HEADER
- The algorithm will look for the flag indicating the beginning of the payload and the end of the header.
- This flag is created by a correlator that will consider a user-configurable threshold value.
- After the flag is locked, the algorithm will start processing the frame.

Applications



Space Data Processor 3.0 alpha 6

Server Time: 2014 090-08:37:38

Transmit

Current Rate: 0.999 mbps
Configured Rate (1.000 mbps)
FWD Address: 127.0.0.1:12345
RS: OFF Rand: OFF

INPUTS
pkts rcvd: 0
pkts rejected: 0

OUTPUTS
CADUs sent: 0
Fill CADUs sent: 9578
Fill packets sent: 0

- VCID 1		CADUs Sent: 0	Fill Packets: 0	Undefined APIDs: 0		
	APID	Type	Rcv Port	Pkts Rcvd	Pkts Sent	Bytes Sent
Audio 1	1	ccsds	12230	0	0	0
Video 1	2	ccsds	12230	0	0	0
- VCID 2		CADUs Sent: 0	Fill Packets: 0	Undefined APIDs: 0		
	APID	Type	Rcv Port	Pkts Rcvd	Pkts Sent	Bytes Sent
DTN Data Link	7	packetize	12232	0	0	0
IP Encap	8	ipencap	12233	0	0	0

Receive

Rcv Rate: 0.000 mbps
Rcv Port: 12346
RS: OFF Rand: OFF

INPUTS
VCDUs rcvd: 0
VCDU Seq Errors: 0
VCDU errors: 0
Fill VCDUs rcvd: 0
Fill pkts rcvd: 0

RS Uncorrectables Blocks: 0
RS correctable errors: 0
OUTPUTS
Pkts Sent: 0
Pkts Seq Errors: 0

- VCID 1		CADUs Rcvd: 0	Fill Packets: 0	Seq Errors: 0	Undefined APIDs: 0		
	APID	Type	IP Address	Rcv Port	Pkts Rcvd	Seq. Errors	Bytes Rcvd
Audio 1	1	ccsds	127.0.0.1	4972	0	0	0
Video 1	2	ccsds	127.0.0.1	4973	0	0	0
- VCID 2		CADUs Rcvd: 0	Fill Packets: 0	Seq Errors: 0	Undefined APIDs: 0		
	APID	Type	IP Address	Rcv Port	Pkts Rcvd	Seq. Errors	Bytes Rcvd
DTN Data Link	7	packetize	127.0.0.1	4974	0	0	0
IP Encap	8	ipencap	127.0.0.1	4975	0	0	0

Software-Defined Radios (SDR)

- An SDR is a “radio in which some or all physical layer functions are software defined”(IEEE Definition).
- A radio is any kind of device that wirelessly transmits or receives radio frequency (RF) signals in the radio frequency.
- An SDR is a radio communication system where components that have been typically implemented in hardware are implemented in software.

Methodology

- GNU Radio has a generic packet decoder block that is not optimized for CCSDS frames. Using this generic packet decoder will add bytes to the CCSDS frames and will not permit for bit error correction using Reed-Solomon.
- The CCSDS frames consist of 256 bytes , including a 32-bit sync marker (0x1ACFFC1D).
- This frames are generated by the Space Data Processor and GNU Radio will perform the modulation and framing operations, including frame synchronization.

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